

NESOPUPA GALAPAGENSIS, A NEW INDO-PACIFIC
ELEMENT IN THE LAND SNAIL FAUNA OF THE GALAPAGOS ISLANDS
(PULMONATA: VERTIGINIDAE)¹

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ABSTRACT

Nesopupa galapagensis, a new species of the pulmonate family Vertiginidae is described from the Galápagos Islands. This is a new record of the genus *Nesopupa*, typically of Indo-Pacific distribution, in the Galápagos fauna.

INTRODUCTION

As the first part of a study of the evolution and ecology of the land snails of the Galápagos Islands, I have collected on the islands of Santa Cruz (Indefatigable), Santa Maria (Florea, Charles), Isabela (Albemarle) and San Salvador (Santiago, James) during the summer of 1970. Of the material obtained, one finding will be discussed below in detail, *Nesopupa galapagensis*, because it represents a new species and a new record of an Indo-Pacific genus in the Galapagos land snail fauna.

DESCRIPTION

The shell: the height is 1.6 – 1.9 mm, the width 1.0 – 1.1 mm, the width – height ratio, .53 –

.65, the height of the last whorl including the aperture is 0.9 – 1.2 mm, that of the aperture alone, 0.6 – 0.7 mm; in percentage of the total height these values correspond to 53 – 67 and 35 – 41%, respectively; the whorl number varies from 4¼ to 5. The *shape* of the shell is nearly cylindrical in 9 specimens, cylindrical-oval or oval in the others; the whorls are convex, the sutures deep, particularly so in the cylindrical specimens; the last whorl ascends upon the penultimate one prior to the aperture, slightly in the oval specimens, more distinctly in the cylindrical ones. The *umbilicus* is minute. The *aperture* is oval-triangular with a notch on the outer lip formed by the inward and forward projecting middle part of the outer lip (this region is

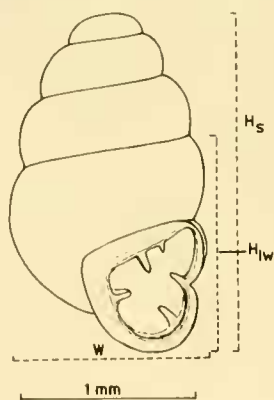


FIG. 1. *Nesopupa galapagensis* Vagvolgyi, new species. 1.9 mm Holotype.

¹ Contribution No. 131 from the Charles Darwin Research Station, Santa Cruz, Galápagos, Ecuador.



FIG. 2. Collecting sites on Isla San Salvador, Galápagos.

sometimes termed "auricle"); the lips are slightly reflected; the parietal wall is covered by a weak callus that connects the origin of the outer and inner lips; the lip swelling is weak but wide, deeply receded from and parallel to the edge of the lips; corresponding to the lip swelling there is a weak and wide annular crest on the outside of the shell. The *armature* consists of a parietal, angular and columellar lamella and an upper and lower palatal fold; the parietal lamella is large, the angular, small; both lie moderately deep in the aperture, and are separated from one another; the columellar lamella is medium large, deeply seated, its inner end is straight; the lower palatal fold is large, the upper, medium to small, both lie deep in the aperture; a sulcus may mark on the outside of the shell the position of either palatal fold. *Sculpture*: the embryonic whorls are smooth (30X magnification); the postembryonic whorls have a fine striation and a shiny, lustrous appearance except in the region of the annular crest where the striation is coarser; there is no sign of any pits. The *color* of the fresh shell is dark brown, that of the folds and lamellae, very light with a brownish tint.

Holotype (fig. 1) and *paratypes* are deposited in the collection of the Academy of Natural Sciences of Philadelphia, nos. 332451, 332452, respectively. Other *paratypes* in the collection of the Delaware Museum, nos. 70650 and of the author. *Type locality*: Peak 2974', central highlands of Isla San Salvador (James Island), Galápagos Islands (fig. 2).

Material examined: Four samples, 2-32 specimens each, 38 specimens altogether.

DIFFERENTIAL DIAGNOSIS

Nesopupa (Infranesopupa) anceyana Pilsbry and Cooke and *N. (Infranesopupa) subcentralis* Pilsbry and Cooke of the Hawaiian Islands closely resemble the new species in size (Table 1), *armature* and *sculpture*; on this basis, *N. galapagensis* is assigned to the subgenus *Infranesopupa*. Both species differ, however, from the new species in being more oval and having shallower sutures, larger aperture and less pronounced auricle. Another similar species is *N. (Nesodagys) wesleyana* Ancy, of the Hawaiian Islands, which agrees with *N. galapagensis* in shape, convexity of the whorls and dentition

but has fine periostracal riblets and a very weak auricle. However, the most similar species is an undescribed one, from Surinam, Dutch Guiana, South America, in the possession of the Academy of Natural Sciences of Philadelphia; the only difference is that the outline is a bit more oval and the dentition a bit weaker than in *N. galapagensis*.

Some species of the genus *Vertigo* also closely resemble *N. galapagensis* in shape, *sculpture* and *auricle* but their dentition is different.

The new species does not show a great deal of similarity to *Nesopupa (Cocopupa) cocosensis* (Dall) of Cocos Island as one might expect from the relative proximity of the areas of distribution of the two species. *Nesopupa cocosensis* is larger (Fig. 1) and has a pitted *sculpture*.

ECOLOGY

Nesopupa galapagensis lives in the high and moist central region of Isla San Salvador (fig. 2). It was found in the thickets and the open fields as well. In the former it lived in the litter layer and the moss pads growing on trees, in the latter, on the ground at the base of the grass. The description of the collecting localities follows:

Station 36. A few hundred yards from Peak 2974', on the southern slope, at about 2900' of elevation. Good soil; impenetrable brush, composed primarily of *Psychotria rufipes* and *Tournefortia rufosericea*. Moss pads on the horizontal branches of many trees (mostly belonging to the species *Zanthoxylum fagara*). Four squares of 25 X 25 cm each were sifted from the litter, and 3 moss pads were taken without measuring size. July 25, 1970.

Station 37a. Pampa or open grassy field at the southern foot of Peak 2974', at about 2300-2400' of elevation. Soil good, wet from several days' drizzle (garúa). Two samples of 25 X 25 cm were taken. The pampa habitat may be a secondary one; according to some botanists, pampas develop only when the original forest cover is destroyed by the introduced goats, pigs and cattle. July 30, 1970.

Station 38. Southwestern side of the crest between Peaks 2974' and 2965', at about 2600-2900' of elevation. Grass, bushes and the giant

fern *Cyathea* make up the vegetation. Five samples of the usual size were taken, 2 from grassy areas, 2 from the base of bushes and 1 from a wash. Soil wet from garúa. July 30, 1970.

Pilsbry noted (1920: 289) that species of *Infranesopupa* are usually found on fronds of ferns and leaves of low plants or occasionally on trunks of trees. My observations that *N. galapagensis* lives both on the ground and on trees are in partial agreement with this.

DISTRIBUTION

Nesopupa galapagensis is endemic to the Galápagos Islands. It is the only representative of its genus there. Its apparent ancestors are the species of *Infranesopupa* in the Hawaiian Islands. It thus represents a new Indo-Pacific element in the Galápagos land snail fauna. Such elements are rare; the only other species of Indo-Pacific relationships among the Galápagos land snails is *Tornatellides chathamensis*. Numerically the Indo-Pacific elements represent somewhat less than 3% of the fauna (2 species of the total reported of 76; based on Smith 1966). The majority of the species are of Neotropical relationships.

The marine molluscs of the Galápagos mirror this composition. According to Emerson (1967) only 25 species or a little more than 4% of the 600 species reported have Indo-Pacific affinities. The similarity may be merely coincidental, however. On the one hand, the rarity of the Indo-Pacific elements among the marine mollusks — as Emerson argues convincingly — is due to the scarcity of suitable habitats: coral reefs for the reef dwellers common in the Indo-Pacific region. His contention is supported by the fact that Clipperton Island, which also lies in the Eastern Pacific but is a coral atoll, has 47% Indo-Pacific elements in its fauna. On the other hand, the reason for the scarcity of the Indo-Pacific elements among the Galápagos land snails appears to be primarily the distance and isolation from that region.

DISPERSAL

The Hawaiian Islands, where *Nesopupa galapagensis* presumably originated, lie roughly 4000 miles northwest of the Galápagos Islands.

Geological evidence indicates no previous land connection between the two archipelagoes or between the Galápagos and the South American mainland (McBirney and Williams 1969). Thus *Nesopupa galapagensis* in all likelihood reached the Galápagos Islands by overseas dispersal, whether by ocean currents, winds, insects or birds it is impossible to say. I do not believe, however, that human introduction was responsible, for two reasons. First, because the species does not occur near human settlements or cultivated areas, in disturbed habitats as introduced species often do (e.g. species of *Subulina*, *Lamellaxis* and *Deroceras* in the Galápagos, Smith 1966); rather it occurs in remote regions, in the litter layer and moss pads which are undisturbed habitats. Another habitat where it also occurs, the pampa, may be a disturbed one; but even this habitat is far away from human settlements. Second, because the species has not been found on the inhabited, cultivated islands of the archipelago; rather, it has been found on San Salvador which has been free of cultivation, although for a while a salt mine was operated on its southwestern shore. Admittedly, future collecting may discover the species on the inhabited islands as well and this fact may then refute the argument. Another possible objection, namely that San Salvador has some special ecological setting which favors *Nesopupa* whereas the other islands lack such seems to have no validity at all as all the islands in question have wet zones which at least in basic features are counterparts of the wet zone of San Salvador.

The process of overseas dispersal is generally considered a fortuitous one and in our case it indeed appears to be so. First, because *Nesopupa galapagensis*, after having crossed a vast extension of open ocean, only colonized one of the 15 major islands of the Galápagos Archipelago, not the other 14. Second, it also failed to colonize the relatively nearby Cocos Island; the latter has been reached independently of *N. galapagensis* by another, not closely related, species of *Nesopupa*, *N. cocosen-sis*. Third, from the Galápagos the species made another huge jump across 600 miles of open ocean and 1200 miles of land to reach Surinam

(refer to undescribed *Nesopupa*). This in itself is remarkable as colonization usually proceeds in the opposite direction, from the continents to the islands. — It is possible that future collecting will prove *Nesopupa* to be a more widespread genus in South America than hitherto assumed, in which case the origin of the Galapagos *Nesopupa* becomes a mute question. However, according to our present knowledge, the Hawaiian origin appears more probable.

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AMERICAN MALACOLOGICAL UNION 40th ANNUAL MEETING

Springfield, Massachusetts, will be the site of this summer's annual meeting of the A.M.U., from Saturday, August 3, 1974 (preliminary registration, 2:00 to 5:00 p.m.) through Wednesday, August 7; to be held in the Museum of Fine Arts and the Museum of Science in downtown Springfield. 1974 President is Harold D. Murray, Biology Dept., Trinity University, San Antonio, Texas 78284; local host is Earl H. Reed, Museum of Science, 236 State St., Springfield, Mass. 01103.

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